ELECTRICAL REVIEW

[ILLUSTRATED.]

A WEEKLY JOURNAL OF

ELECTRIC LIGHT, TELEPHONE TELEGRAPH AND SCIENTIFIC PROGRESS.

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Recent Progress in the Manufacture of Accumulators.

The introduction of the storage battery since the erection of the large factories of the Electrical Accumulator Company, at Newark, N. J., has been pushed forward with greater success than at any time during the past four years, and the accumulator of to-day is filling its place successfully in many installations of incandescent lighting throughout the country; its practical utility was demonstrated several years ago, and it was waiting only for capital, business tact, and energy, to place it where we find it everywhere to-day. We present to our readers on several pages of this edition some exceedingly interesting and instructive views of the interior of the immense manufactory of the Electrical Accumulator Company, showing the different processes in the manufacture of its accumulators, and our readers will be impressed with the extent this business has assumed. The standard type of cell manufactured by this company is known as the "15 A" and is made up of fifteen plates (eight negatives and seven positives, the positives being the smaller to allow for the "growth" or expansion that gradually takes place.)

FIG. 5.—ELECTRICAL ACCUMULATOR COMPANY'S FORMING ROOM; EIGHT ROWS OF FORMING BOXES FOR CHEMICALLY FORMING PLATES.

The internal resistance claimed for the battery is extremely low, say from .001 to .005 ohm, and the range of current large. The capacity of the battery, it is stated, is somewhat underestimated at 350 amperes hours; 35 amperes, a safe working current, will last for ten hours or more, or a less current would be supplied by the cell for a proportionally greater number of hours.

As we have stated already, the introduction of the electrical accumulator in connection with incandescent lamps offers the most satisfactory solution of the problem of lighting railway trains.

The special advantages of the electric light are nowhere displayed to a greater advantage than when utilized for the benefit of those who are compelled to spend a large portion of their time on the rail, and who know better than all others how much depends on pure air, moderate temperature, a steady light and assurance of safety from fire.

Each car, under this system, carries its own supply, and is thus independent of all others, a steady light being assured at all times, whether the train be at rest or in motion. Each lamp may be arranged to be turned on and off at will, and arrangements may be provided by which the lamps in one part of the car can be turned down, while the remainder continue to burn at full candle power—in short, every requirement of the problem may be met

In view of the fact that accumulators may be charged from any electric lighting circuit, and that such circuits exist in the vicinity of every important railway station in the country, it is evident that the recharging of the cells is a simple matter, only requiring a special plant in isolated cases. This company has an entire system so simple in all its details, that with a little general instruction, any one can attend to its manipulation.

The exact number and arrangement of the cells will, of course, depend entirely upon circumstances, but the following data kindly furnished us by Secretary Truex, will be of interest as showing in a general way what can be done.

Thirty cells, weighing about fifteen hundred pounds, will run twenty lamps of sixteen candle power for ten hours when fully charged.

Twenty-four cells, weighing about twelve hundred pounds, will run fifteen lamps of sixteen candle power for ten hours.

Thirteen cells, weighing about six hundred and fifty pounds, will run six lamps of sixteen candle power for ten hours.

The cost of equipment, it is stated, varies from two hundred dollars to six hundred dollars per car, according to the number of lamps, hours of burning, etc., and the cost of lighting under ordinary conditions will not exceed a fraction of one cent per lamp per hour.

Accumulators, according to the same specifications, have stood the test of continual use in England and on the continent during the past two or three years, and the annual cost of maintenance was no greater than the maintenance charge for ordinary machinery.

Colonel J. N. Keller, for several years past manager of the New England Telephone Company, and well known in electrical circles throughout the country has recently been appointed general manager of this company, and we would remark that they are to be congratulated in having obtained the services of a gentleman so thoroughly capable and efficient both in a business view and as an electrician. President Vail, however, was never known to make a mistake in this particular; his excellent staff and organization throughout could hardly be excelled.

The Vestibule Train and Its Electrical Equipment.

The most gorgeously-appointed excursion train that ever turned a wheel in the United States left the Chicago Union Depot on the 8th for St. Paul, Minneapolis and vicinity, conveying the members of the Boston and Chicago Commercial Clubs.

The train consisted of nine cars of the new Pullman patterns, including hotel, drawing-room—with library—vestibule, and other specially-named forms of elegant sleeping and combination coaches.

The annoyance and danger of crossing from one coach to another is completely done away with in this train, a sort of accordeon bellows at each end of the car making a dust and noise-proof joint, while a door opening at right angles to the passage-way permits egress and ingress. By this arrangement half a dozen cars may be thrown into one without annoyance from smoke. The new arrangement is only unfortunate in one particular. The peanut and book fiend will be enabled to carry a larger armful of trash for distribution, and be capable of inflicting a proportionate increase of misery on a suffering public.

Messrs. Johnson, Holland & Co have lighted these cars by means of accumulator cells of class B of the New York Electrical Accumulator Company's batteries. These batteries are placed in two boxes underneath the coaches, and through each of these two circuits have been run, one for the body of the coach, and one for the vestibule, closets, drawing room, etc. In the dining room car there are twenty-one lights, fifteen in the combination coach, and twenty-three in each of the sleepers.

The interiors of the coaches are simply gorgeous when illuminated. The bright, shining lamp fixtures, to which the lights are attached, are so many mirrors to break up and distribute the rays.

Judging from the prodigal amount of good things which are constantly arriving and disappearing inboards during the last hour previous to departure, it was quite evident that the commissary had a Kentuckian's experience, and knew better than to waste much money on bread and crackers, when "no gentleman never needs nothin' o' that sort, when he goes a-fishin', sar!"

—— At Tokio, Japan, a company, with a capital of £40,000, has been formed to supply the electric light from central stations. It is proposed to establish five centers in Tokio, two at Osaka, two at Nogoya, and one at Kioto. The company has received an order to supply the imperial palace with current for 2,000 incandescent and 100 arc lamps for their first central station.

Proposed Absolute Unit of Time by Electrical Measurement.

The fact that our present system of measuring the flight of time, based, as it is, fundamentally upon purely astronomical observation, is not so rigorously exact as it was once supposed to be, is undeniable—and regrettable. Poisson was thought to have proved that a change in the length of the sidereal day amounting to one ten-millionth part in 2,500 years was incompatible with the occurrence of an ancient eclipse which the Chaldeans have recorded in their sculptures; and similar calculations were made by Laplace. But, alas! these great mathematicians were in error. It is not so. Slowly but surely the recurring tides are putting an effective drag upon the whirling earth, and it is calculated that already the day is longer from this cause than it was in the year 720 B.C. by as much as one part in 2,700,000 But this is not all; the velocity of the diurnal rotation of the earth is necessarily affected by anything which disturbs its moment of inertia about the axis of rotation, and this we know must be continuously diminishing—and, therefore, the velocity is being retarded—by reason of the secular cooling of the earth and its accompanying contraction in bulk. Only last week we read that a mountain peak in Arizona had been overthrown, and it is a mournful aggravation of the calamity to know that thereby the value of our present standard of time has been altered to an unknown and an unascertainable extent. The ceaseless fall of meteoric dust is a cause of still further discrepancy. Can nothing be done? How long shall science labor under the reproach that our fundamental unit of time is not constant, even if ascertainable? The reproach cuts even more deeply when it is recognized that, for certain of the very same causes as we adduced above, the unit of mass labors under a similar charge of inconstancy, while, as for the unit of length, it has long relinquished even the pretense of having any foundation in nature. It is true that many years ago Prof. Clerk-Maxwell expressed the opinion—an opinion in which we still venture with deference to concur—that the science of the future would base its fundamental units of length and time upon the exactly ascertained wave length and period of vibration of one selected light ray *in vacuo*. The conception is worthy of the genius of Maxwell, though even here we must perforce admit that a painful doubt creeps in. Who shall assure us that in the course of time the structure of the ether itself shall not undergo modification? At this point, as at so many others, the unwelcome conviction is forced upon us that it is the relative alone in which the human mind finds its appointed field of action—the absolute is synonymous with the unknowable. Failing, then, a loftier flight, does it not still remain a wise and legitimate quest to seek to attain as nearly as may be at least to constancy and accuracy in our standards? So, at least, thinks M. Lippmann, and far be it from us to dispute the proposition. M. Lippmann is also in all probability correct in tacitly assuming that the time has not yet arrived when Maxwell's suggestion can be adapted as a practicable scheme. He has therefore undertaken a new and thorough consideration of the subject—and this, it should be remembered to his credit, before the announcement of the fall of the Arizonian mountain peak—with the result that in a brilliant note recently presented to the French Academy he proposes a solution which is practically the following: M. Lippmann, while retaining the element of time as one of our fundamental units, would make its value depend directly upon our knowledge of the unit of length. We have all been taught from our earliest (electrical) infancy that electrical resistance has the same dimensions as velocity. Sometimes, indeed, we say that resistance is a velocity, and then it is to be feared that we tend to get a little mixed. Now a velocity, it is needless to observe, is a length divided by a time; consequently, by a slight effort of the mathematical imagination it will become equally clear that the reciprocal of a velocity when divided by a length must be an expression signifying a time interval. We have also to observe with equal care that in the inscrutable wisdom of the physicists who have devoted their talents to the development of Fourier's "Theory of Dimensions," it has been decreed that resistance, while possessing always the same dimensions, should be expressed in electrostatic units, not directly as a velocity, but as the inverse thereof. Once more, the specific resistance of any substance is a quantity which must necessarily vary directly with the unit of length. But it has been shown (axiomatically) that the reciprocal of a velocity divided by a length yields a definite period of time. Now, therefore, it is abundantly clear that making only the assumption that the specific resistance of a given substance, measured electrostatically, is an absolute and invariable quantity, then the electrostatic measurement of the specific resistance of any such substance yields an absolute measurement of time. Thus is our fundamental measurement of "the great independent variable," which Hobbes defined as "the phantasm of before and after," rescued from the accident of toppling crags or flowing tides, and securely based on the verification of the unit of length and the accurate determination of the electrostatic resistance of a cubic centimeter of mercury.—*London Electrician.*

French and English Measures.

To convert millimeters into inches, multiply by .03937.

To convert meters into inches (or millimeters into mils), multiply by 39.37.

To convert meters into feet, multiply by 3.281.

To convert meters into yards, multiply by 1.094.

To convert kilometers into statute miles, multiply by .6214.

To convert kilometers into nautical miles, multiply by .539.

To convert grammes into grains, multiply by 15.44.

To convert kilogrammes into pounds, multiply by 2.205.

TERMS OF POWER.

A kilogrammeter is 7.23308 foot-pounds.

A foot-pound is .138254 kilogrammeter.

One horse power British measure=550 foot-pounds per second=33,000 foot pounds per minute.

One *force de cheval*, French measure=75 kilogrammeters per second = 542.48 foot-pounds per second=.9863 British horse power.

One British horse power=1.01385 *force de cheval.*

One man power=$\frac{1}{8}$ of horse power.

A TABLE OF MEASURES OF LENGTH.

		U. S. Ins.
United States and British	Foot	12.
Amsterdam	Foot	11 144
Antwerp	Fuss	11.275
Austria	Fuss	12 445
Belgium	Elle	39.371
Brazil	Cubit	25.98
Bremen	Fuss	11 38
Brunswick	Fuss, or Schuh	11.23
China	Chik (Commerce)	14.1
Denmark	Fod	12.357
Egypt	Derah	25 49
Florence	Braccio	22.98
Greece	Cubit	18.
India	Cubit	18.
Japan	Fan	12.
Mexico	Pie	11 28
Norway	Fod	12.35
Persia	Arish	38.273
Portugal	Foot	13.33
Prussia	Fuss	12 35
Rome	Pie (Commer)	11.59
Russia	Foot	13.75
Sardinia	Oncia	16.66
Sicily	Palmo	9.537
Spain	Foot	11.122
Sweden	Meter	39.37
Switzerland (Berne)	Fuss	11 818
Switzerland (Geneva)	Fuss	28.028
Turkey	Pic (Great)	27.9
Venice	Pie	13.68

HEAT UNITS.

The French unit, the caloric, is the amount of heat required to raise 1 gramme mass of water from 0° to 1° cent.

The English unit is the amount of heat required to raise 1 pound of water from 60° Fahr. to 61° Fahr.

—— The Westinghouse Electric Company are meeting with a large demand for their alternating system for central station work. The shops employ about 1,200 men. They have now over forty stations under construction or in operation. Recent contracts have been made in Pittsfield and Springfield, Mass.; Hartford, Conn.; Denver, Colorado Springs, and Ouray, Colorado; St. Louis, Mo.; Cornwall, Canada; Littleton, N. H; Portland, Me.; Morristown, N. J., Staten Island, N. Y., Galveston, Tex., and Charleston, W. Va

Paper covered with sulphate of barium is useful in self-registering telegraph instruments. The lightest touch leaves a permanent trace.

Electric Locomotion.

As will be seen from the following our contemporary, the London *Electrical Review*, strongly endorses Mr. Reckenzaun's paper which we published recently. One of the most remarkable characteristics of the admirably practical paper read by Mr. Reckenzaun last week before the Society of Arts, and one which must have made itself apparent to all his hearers, was the total absence of that egotism which so often detracts from the value of papers read before scientific societies. Such self-sacrifice from the man who has taught his imitators the greater part of the knowledge they possess of the subject under discussion, and whose failures have led to the successes of others, cannot be allowed to pass unnoticed, and we trust that ere long Mr. Reckenzaun's disinterestedness will reap the reward which such a virtue deserves.

One would scarcely credit that so many lectures had been delivered in the hall of the Society of Arts within the last six years, and that so little had been the result of the efforts made to impress upon commercial men the fact that electricity is a cheap and convenient means of locomotion, but we are fain to believe that the Rubicon has now been passed, and that in a short time considerable activity will be manifest in this, the most suitable method of tramcar propulsion in large cities. The facts which the lecturer submitted to his audience respecting the electric tramways on the Continent are full of interest, and if statistics had been forthcoming from American sources also, we fancy that even the tramway director, who thinks of nothing but pounds, shillings and pence, must have been inclined, perhaps against his will, to give serious consideration to the idea of utilizing electricity in preference to horses or steam power, so apparent did Mr. Reckenzaun make the economy of the electrical systems passed in review.

We need not here discuss the method of gearing employed by different inventors, nor the systems of conductors, whether underground or overhead; these were ably dealt with in the paper, and one and all appear to have special functions under certain conditions Suffice it to say that Mr. Reckenzaun made it clear to the most casual observer that electrical propulsion is reliable, and that even now the inclusive cost can be brought down to 3½d. per car mile, and in some cases still lower.

One would naturally have thought that the discussion on a paper of such a practical nature would have brought out much useful information, but, unfortunately, several of the gentlemen who rose to give vent to their feelings did not, like the lecturer, ignore the personal equation, but on the contrary, entered into matters quite beside the questions under consideration, much to the annoyance of those who expected to derive a little intellectual enjoyment from the arguments. Still, amongst the chaff some grain can be found, and it is to these siftings that we mainly desire to draw attention. Perhaps of all the remarks which were passed during the evening, those of Sir John Jenkins and Mr. Capper are, to a technical journal, the most important. These gentlemen are connected with a tramway or short railway, from Swansea to the Mumbles, one of the oldest in the kingdom, the bill for which was originally for a canal. This bill passed as for the canal on the second reading, but it came out of the House of Commons as a railway in 1804. Sir John Jenkins stated that the cost of running on the railway was less than on ordinary tramways, and the question in all these cases was really which was the cheapest motor. As Mr. Holroyd Smith had said, there was a great objection to electricity on account of the third rail, but independently of that, Sir John did not think the time had yet arrived when electricity could compete with steam power, where it was practicable to use it. The cost of Mr. Reckenzaun's mode of working would be about 3½d. per train mile, but the cost of the small line he referred to was not more than half that. Almost every possible motive power had been tried, including sails, but nothing was so economical as the steam engine.

Mr. R. Capper went further than did his colleague, and said that naturally, having to carry three-quarters of a million of people a year, they looked at all these things very closely, but he had never yet come across any instance of an electric motor, as applied to tramways, which it would answer their purpose to adopt. There was still a field open to any one who could show them how to make that six miles of line pay better by electricity than it did at present with locomotives.

Now, if we are not mistaken, the locomotives which are employed between Swansea and the Mumbles are built specially for the purpose, and are therefore wasteful in fuel. They draw, we believe, three cars each, and run once an hour, and, in winter, with occasionally not more than half a dozen passengers. Coal, of course, is cheap in Swansea, but then that is also in favor of electricity, although the price of fuel does not amount to a large percentage of the total cost per car mile. What we would like to know is how Sir John Jenkins arrived at his estimate of 1¾d. per train mile. Perhaps he takes into consideration only the cost of fuel; but this is not enough, and until he shows us how his calculations are made we must decline to accept his figures as being anywhere near the truth. We do not make this remark as a mere surmise, but base our belief upon an actual inspection of the line and plant, and upon conversations with Mr. Capper himself, who, unless our memory is a treacherous one, had, even two years ago, a well founded idea that electricity, if absolute dependence could be placed upon its reliability as a motive power, might be made to carry the traffic between the two termini at a cheaper rate than do steam locomotives.

Mr. Capper, we feel sure, has not taken an antipathy to electric locomotion, and therefore we can only think that his very emphatic opinion is the result of a misconception of the actual cost entailed in the working of the line he represents. The field, as he puts it, is open to any one who can show the managers how to apply electricity economically, and we hope that some one will be found bold enough to enter the lists. There is neither gradient nor curve on the whole line worth taking into consideration, and we believe that at the Mumbles there is water power in abundance running to waste, which would amply suffice to drive turbines producing more than the necessary motive power.

We do not wish it to be thought that we advocate the employment of electricity on ordinary railways; steam is the right thing in the right place there. But we cannot help thinking that the Swansea-Mumbles line was, unwittingly it is true, constructed to be worked electrically, and we cannot imagine a more suitable locality in which to make the attempt to show what a great field of enterprise is open to the supporters of electrical traction.

Perhaps the Electric Locomotive and Power Company may think it worth while to turn its attention to the little Welsh line, and such a proceeding does not seem very improbable, seeing that the company has a much more ambitious scheme under consideration; but naturally the first question to be decided is that upon the solution of which the early adoption of electric locomotion upon anything like an extensive scale will very greatly depend, viz., the experiments on the North Metropolitan Tramways at Stratford, concerning which the company's chairman, Mr. Richardson, spoke very hopefully last week.

—— The report of the Wire Gauge Committee of the National Electric Light Association was not received in time for publication in this issue.

—— The Westinghouse Machine Company, averages shipments of nearly 60 engines per month, the average size being about 45 horse power. They have been suffering severely from lack of foundry capacity since the recent fire, but the new foundry, nearly completed, will enable them to turn out at least 100 engines per month.

Electrical Measuring Instruments.

By Sir William Thomson, F.R.S.

The current-measuring instrument commonly called by the name of galvanometer, whether it be the sine galvanometer, the tangent galvanometer, or any of the different varieties of mirror galvanometers in use, is essentially magnetostatic. That is to say, it is an instrument in which a controlling magnet is used to balance the electro-magnetic force produced on a magnetized steel needle by a conductor or coil through which flows the current to be measured. In the sine galvanometer and tangent galvanometer, as originally used, and as still largely used for many important electrical measurements, the controlling magnet is the earth; but it is only in a locality far from dynamos and from wires carrying continuous currents for electric lighting, that the terrestrial magnetic field suffices for a sine or a tangent galvanometer when any approach to accuracy is required; and thus in telegraph offices, workshops, and engine rooms it is generally desirable, if not absolutely necessary, to use a much stronger magnetic field than that of the earth for controlling the needle of a galvanometer; but whether the controlling magnet be the earth, or a steel magnet, its force is essentially inconstant, and therefore a magnetostatic galvanometer of any kind requires some means for determining from time to time the coefficient by which the absolute value of the current measured can be calculated from its indications, or a means of freshly adjusting the field to give any convenient absolute value to the readings on the scale of the instrument.

Sixteen or seventeen years ago I introduced a form of tangent galvanometer, which came to be called the "paddle-wheel galvanometer," from the appearance of the two coils being somewhat like the paddle-boxes of a paddle-steamer. In this instrument two coils adjustable to any desired equal distances on the two sides of the center, act on a small needle, or group of small needles, hung by a single silk fiber, and carrying a pointer of about eight centimeters length, which shows deflections on a scale of unequal divisions proportional to the tangents of the deflections. Ordinarily the needle is acted upon by the terrestrial magnetic force alone; but sometimes in laboratory experiments a controlling magnet is placed either to augment or to diminish the controlling force on the needle. This instrument, though capable of considerable accuracy for absolute measurement in a locality free from local magnetic disturbance, was replaced by my graded galvanometers, which have been found much more convenient for general purposes, and have been somewhat largely used since they were brought out five years ago. I have never, however, been satisfied with them, and I have been incessantly occupied in the attempt to produce an adjustable magnetostatic tangent galvanometer, which shall be both more convenient for ordinary use and more susceptible of high accuracy for scientific investigation than the graded galvanometers. I am not able this evening to show more than a half-finished attempt to realize this object, but I feel that I am now nearly touching it, and I hope at the commencement of next session to be able to place before you a working instrument of the magnetostatic class, which shall be thoroughly convenient for showing the number of lamps alight at any time in an ordinary dwelling house lighted by Edison-Swan lamps with direct current, and which shall also be available as a scientific measuring instrument to measure currents of from one to sixty amperes with a proportionate accuracy of one quarter per cent. in the best part of its scale.

I have also made great efforts during the last six years to produce satisfactory constant standard instruments for measuring electric currents, and I have from time to time placed before you results in which the object was, to some degree, realized, but, as I have always told you, not satisfactorily. This time last year I placed before you and explained instruments depending on Faraday's discovery of the tendency of a globe, or cube, or short bar of soft iron, to move from places of weaker to places of stronger force in a magnetic field. Two of those instruments which you saw, and which were then nearly completed, are again before you, and are now indicating the potential of the current by which we are lighted this evening. You see, when I increase the potential by reducing resistance, how the indicator shows —now an augmentation of 2½ per cent., which makes the lights considerably brighter —now again a diminution of one per cent.— and again the previous potential and the lights as they were. Since you first saw them these two instruments have been incessantly at work on the electric light wires in my house and laboratory, and have done good work all this time. I may say, in passing, they have allowed me to use much higher incandescence without risk to the lamps than would have been practicable without a trustworthy potential indicator, and personal, if not automatic, attention to regulate the potential according to its indications

Though, however, they have so far been practically useful to myself, I am not satisfied with the instruments because they involve the use of soft iron, the retentiveness of which is always a serious trouble which I have only been able to keep within bounds, not completely to eliminate, by the use of the current reverser, which you see in connection with one of the instruments before you. I have, therefore, returned to the original discovery by Ampere of the mutual force between movable and fixed portions of an electric circuit, first utilized by Weber in his "Electro-dynamometer," to obtain a constant standard instrument for measuring electric currents without any of the trouble and residual inaccuracy entailed by the use of soft iron. After many trials I have succeeded in improving an electro-dynamic balance, towards which I made a great many trials five years ago; and within the last three months I have succeeded in my laboratory in making accurate measurements of currents of from twenty milliamperes to 200 amperes by means of four instruments on the general plan of the rudimentary centi-ampere balance before you, in which a single movable coil is repelled and attracted upwards by two fixed coils, one below it and the other above it, and the total of the electro-magnetic force is balanced by a weight hung on a knife edge attached to the balance. At the commencement of next session I hope to show you some of these instruments in a state fit for practical work. In the meantime I can only thank you for the patience with which you have listened to me this evening, and for the kindness with which now, as on previous occasions, you have allowed me to bring half-done work before you, and to tell you of what I hoped to do, but had not yet done, in the way of producing practically useful instruments—*London Electrician.*

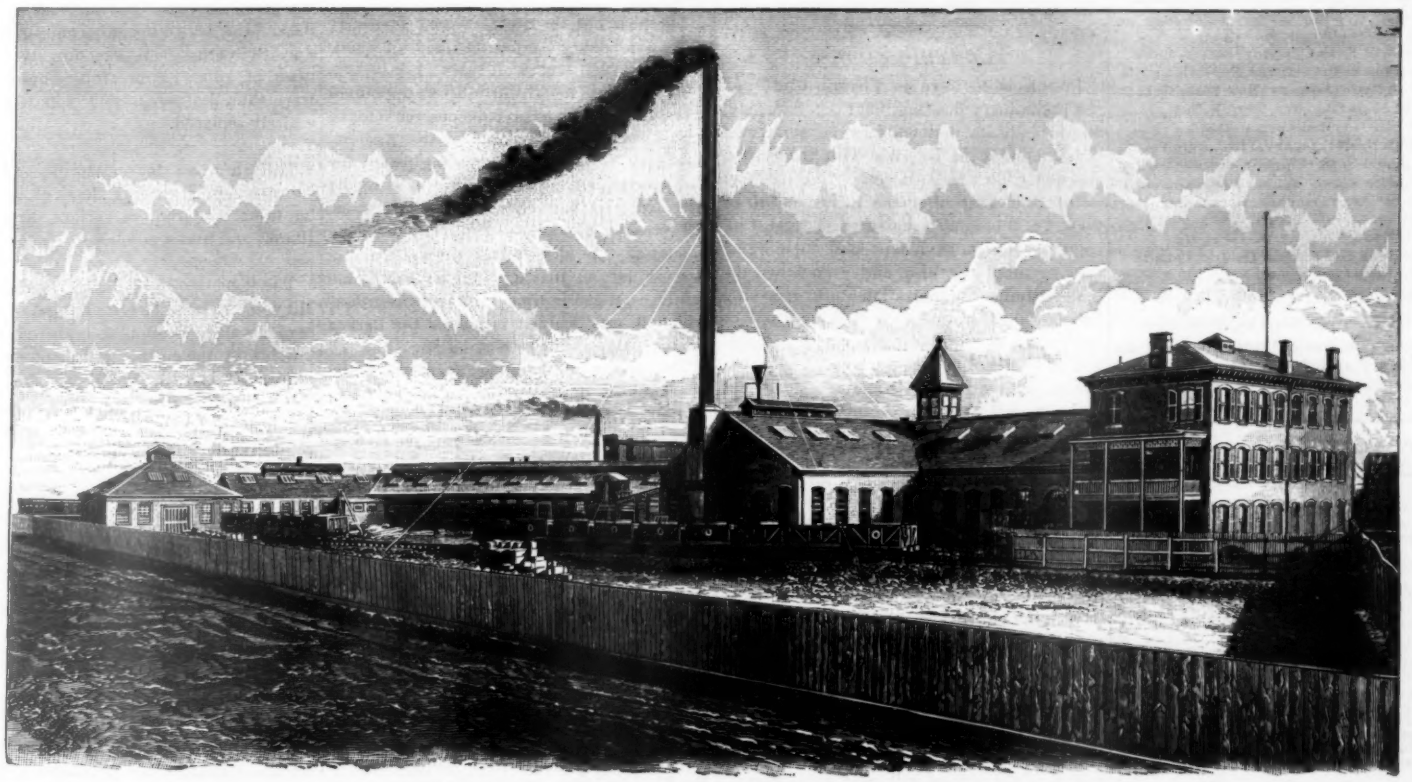

Fig. 1.—Rear View of the Electrical Accumulator Company's Works, Newark. Office Building to the Right, Foundry on the Left.

*** Since the year 1882, when the telephone was first employed in the French army, during the field maneuvers, much attention has been paid to its development, especially for out-post service. Magneto instruments, dispensing with batteries, are exclusively employed, and a special telephone corps is now being organized, which will have an organization distinct from that of the military telegraphs, its purpose being, in fact, wholly different.

A New Business and a Call for Capital—Circumstances Under which P. T. Barnum Might Invest.

A representative of M. Fortin-Hermann, the inventor, writes from Paris May 21, to Hon. P. T. Barnum, of Bridgeport, Ct., as follows:

"I presume that you will have read, in the political or special papers, of Mr. Fortin-Hermann's newly invented cable. This cable allows to telephone to any distance in the world; and for this reason as well as on account of its special durability, which guarantees its perfect use (99 years amortization) it has been adopted by the French Government. By the same cable an 'audition' of the Paris Grand Opera has been transmitted to the King of Belgium in Brussels. I am of opinion that in transmitting the Paris Grand Opera every night to America, say to New York, would be a profitable business. The cost of cable from Paris to New York, allowing 200 persons to hear at the same time, as distinctly as if they were in the Paris Opera House, would be about 15 million dollars. Let us say that they will be charged for hearing one act, five dollars only, which will make for 200 persons, one thousand dollars for each act; this will make for four acts (there are many operas with five acts) $4,000 every night, say $1,460,000 a year. This sum is highly sufficient to cover the interest and amortization on the invested capital; and as the performance at the opera takes four hours the remaining twenty hours of the day may be used for business and other telephonic communications between Europe and America, which in fact will constitute the main profit. Are you inclined to take this business up with your financial friends?

I am at your disposal for all further information."

[Signed.] Jules Grunekey,
Representant de M. Fortin-Herrmann.

Mr. Barnum has ordered his Paris agents to investigate this matter, and if found practicable as represented, he will be one of fifteen to take the stock in the new cable company for the general and specific purposes proposed.

*** A fire occurred in the operating room of the Western Union Telegraph office in the First National Bank building in Pittsburgh on Friday last. The hundreds of wires centering at the main switchboard were quickly burned off, and all communication destroyed. The telephone exchange on the third floor was also burned out, and the Electric Light Company's wires severed. The direct loss of property to the Western Union Company is $50,000, the telephone company loses $20,000, and the loss on the building is $30,000, making a total of $100,000, which will probably be increased by other losses. We give elsewhere full details of the loss.

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EDITORIAL ANNOUNCEMENT.
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Preparations have been made by Messrs. Ward, Callender, Insull, and others, for a dinner on Monday, June 20, to celebrate the jubilee of Queen Victoria's accession and of the establishment of the telegraph in England. It is thought that there are many electricians of English birth, descent or business connections who will gladly avail themselves of the opportunity to unite on such an interesting occasion, and a large number have already assured the committee of their cordial participation.

The dinner will take place at Martinelli's Restaurant, 136 Fifth avenue (near 19th street) at 7 P. M. The tickets will cost $2 each (including wine.) The dinner will be followed by speeches and by an amateur musical entertainment.

On Wednesday last Colonel John B. Powell, the popular and efficient general manager of the Brush-Swan Electric Light Company, of New England, sailed for Europe for a short vacation which he has well earned.

An electrician, hailing from Boston, presents the following as the definition of the counter E.M.F. in the primary of an induction coil: "Nature's beautiful automatic resistance."

An electrician visited an arc light station and placed his hand on one of the pole pieces to see if the machine was hea ing and received a severe shock. It was found that a funny storekeeper had connected a fine wire from his arc lamp to a metal railing in his store, and any one touching this received a shock. Such work should be made an offense against the law. The possible danger likely to result from a second ground is certainly worth considering. The second ground may be on a telephone or telegraph wire, and any one touching these will receive a severe shock, or it may be through the body of a trimmer who is momentarily stunned and made to fall from a dangerous height, or a fire may result. In the present instance the insulation between the copper and iron of the machine was faulty. Regulations requiring a test to be made twice a day for grounds are not onerous, and an immediate repair of the defect would reduce the already small number of damages to life and property from electric lighting.

ELECTRIC CLUBS.

Boston is to have an Electric Club, and the preliminary meeting, held last Saturday, would indicate that wide-awake gentlemen are interested in it. We wish the Boston Electric Club every success. The fact that within one year after the Electric Club of New York became an assured success, Chicago and Boston have expressed their intention to adopt the idea, and even across the water similar organizations are receiving serious consideration, is a striking proof of the extent of electrical work and thought, and of the timeliness of the movement inaugurated here at the metropolis. It is not amiss to call attention at this point to the several valuable scientific and practical subjects discussed at the monthly meetings of the New York club, including addresses from such able and well-informed gentlemen as Stephen D. Field, Henry Hine, Rudolf Eickemeyer, John W. Beane, J. A. Powers, Dr. Benjamin and others, which were followed by earnest and pointed discussions by the best men in the electrical field. The strength and pronounced success of the New York club seems to have come forth from the happy blending of the scientific, the practical and the social elements; and if the other organizations are able to start on such a comprehensive platform, we have no doubt but well rounded success will greet their efforts.

PATENT OFFICE WORK.

That less careful examination is given before issuing a patent than formerly is a result of the vast growth of the business. In the early days of the office it was a comparatively easy matter to examine all the records and all scientific publications relating to the question in hand. Now, notwithstanding continued subdivision, each examining department has to cover many times greater ground than was once the case for all combined. Confusion is sometimes caused by two or more patents containing identical or similar claims. There are many workers in the field of original research, and the publications of their results are sometimes not accessible until some time has elapsed. An inventor may make the same discovery or application subsequently, and still receive a patent before the report of the work which anticipates his invention is given to the world.

A few years ago an application was filed for letters patent on a mechanical contrivance which, among other parts, contained a crank which was not claimed. Through a very natural oversight no disclaimer was made that the crank was an old mechanical device. In due time the office made reference to a patent in which a crank was apparently claimed. Nothing daunted, the inventor replied that once there lived a man named Tubal Cain, and that if he did not invent the crank his son did, and charitably sunk his personal interest by not applying for a patent, but gave it to the world. It seemed therefore that the crank ought by this time at least to be public property. The patent was at once granted.

PREPARING FOR THE SEMI-ANNUAL ELECTRIC LIGHT CONVENTION.

The preliminary arrangements for the next convention of the National Electric Light Association were made in Boston last week. The Executive Committee held two meetings, on Friday and Saturday, at the office of Chairman Fred. A. Gilbert, 17 State street.

President Morrison and Secretary McCoubray were present from Baltimore, and Messrs. Gilbert and Ridlon from Boston. Absent members sent telegrams and letters expressing interest in the coming meeting. Messrs. A. V. Garratt and M. M. Slattery, of Boston, were placed on the Executive Committee to act during the absence of Messrs. Bowen and Holbrooke, thus insuring a quorum in Boston at all important committee meetings.

The report of the Secretary and Treasurer showed a balance of cash on hand of about $275.

Messrs. Ridlon and Garratt were appointed special committee to prepare circulars to be sent to delinquent members of the Association and to members preparing papers for the convention. This committee's report was accepted and circulars ordered sent. All papers, it was decided, shall be in the hands of the Executive Committee by August 1st, so that a complete programme can be arranged in time for the convention, which it was decided to hold at the Parker House, August 9th, 10th and 11th.

The matter of deciding on printing the report of the last two conventions was, on motion, left to the August meeting of the association. A proposition was made by a printing company to print these reports free if the company was permitted to use some of the pages for advertising. This offer was rejected.

Mr. R. W. Ryan, of New York, was elected official stenographer of the association.

A communication from Mr. Carl Hering, of the Committee on Insulation, appointed at the last convention, asking privilege of employing an assistant at $3 a day, and an allowance of $1,000, and that the association assume all responsibility of damage to apparatus, was respectfully but firmly declined, Mr. Slattery being appointed a committee of one to frame the reply.

The secretary was requested to ask the chairman of the various committees to report at once to the chairman of the Executive Committee.

Informal discussion occurred at different times during the meeting, and general expressions of the excellent prospects of the Boston meeting were numerous. The matter of widening the field of active membership was discussed, and will be brought before the next convention. Before adjourning it was decided to hold a banquet at 6 o'clock Thursday evening at the Parker House. This will be the first banquet participated in by the association, and will no doubt be an enjoyable and entertaining event. The Executive Committee will meet again in Boston at 17 State street, August 5.

The arrangements with the proprietors of the Parker House are such that delegates will find to be very convenient. A large double parlor on the first floor will be used as an assembly room, and on the same floor and the floor immediately above are several convenient exhibition rooms. A number of excellent papers have already been promised, and the feeling was generally prevalent that the next meeting would be a large and enthusiastic one, successful in a high degree.

The Electric Club house, 17 East 22d Street, is being rapidly fitted up for occupancy.

OUR CHICAGO LETTER.

(From a Special Correspondent of the ELECTRICAL REVIEW.)

Los Angeles, Cal., is having trouble with some new form of fire alarm apparatus, which it is claimed by the chief engineer does not come up to the mark. Considerable feeling was manifested on the subject at the city council meeting on the 31st ultimo. In electrical fire alarm systems it is well to have the endorsement of time—good ones are like wines, and improve by age.

Speaking of fire alarms, a certain town in Illinois is anxious, and has signified its wants. It requires 3½ miles of line, with 10 fire alarm boxes, provided these can be furnished at a sum not exceeding $200, that is $20 a box, with the line and poles thrown in!

The Central Union Telephone people had a wrestle with the elements in Decatur on the 7th instant. Lightning seemed to have gone on a spree, and in celebrating an anniversary, or something, had everything its own way with a sort of local-option discretion. In the course of its performances it wandered into the Central office tower and danced the devil's hornpipe among the paraffined wires until all was one irredeemable mass of ruin. Some four hundred wires were thus destroyed, and will have to be entirely replaced.

The 7th was a day of storms, and several catastrophes, including loss of life from lightning, occurred in various directions in Illinois and States adjoining.

The "gentlemen of Japan," including the Mikado, are to be electric lighted. The emperor's palace is soon to be invaded by the knights of the cutting plier and solder pot, headed, it is said, by W. H. Brenner, of Cincinnati, and Japanese life made miserable for the time being by these barbarian fiends of the Western Hemisphere.

The telephone bill, which originated in the Senate of Illinois, was amended by its paternal ancestor, Baker of Edgar, has wriggled through that august body, and has now got into the House. The bill provides, among other things, that a "suitable device or meter shall be provided by the company to correctly register the number of connections made during the month."

As an illustration of what the system of the Police Telephone and Signal Company can accomplish, when properly handled, the following figures from the police superintendent's yearly report are given:

The total number of policemen on duty was 1,036; of these about 10 per cent. or 104 men are detailed for this signal service. The total number of arrests by the police force was 44,261, of which over 19,000 were made by the signal service detail, or 43 per cent. of the entire arrests made.

The incalculable value of the system, in caring for the unfortunate, restoring lost or enfeebled persons to their friends, the prevention of riot, the removal of intoxicated or riotous persons, cannot be too highly extolled; and the readiness with which any emergency, requiring the immediate presence of any number of officers for any purpose whatever, is satisfied, render the use of this system indispensable where law and order are desired.

The Chicago Club held a meeting on the evening of the 9th at Parlor A, Grand Pacific Hotel. The membership was increased very materially, and the roll has assumed such proportions as to render the success of the enterprise a fixed fact. The meeting was enthusiastic and in every way encouraging. One matter for discussion was the latitude which may be allowed in qualifications for membership. The general opinion, as expressed, seemed to be that the range should not be fenced in by restrictions which would demand a knowledge of the principles or practice of any branch of electricity. A

man might be interested, and be a good member without knowing these. Prof. Barrett suggested that application for admission was a pretty fair endorsement of a disposition to become an interested companion. The whole matter of selection was finally left to the committee on membership.

A committee on entertainment was appointed by the chair, with instructions, pursuant to a motion, that an introductory banquet be part of the programme for the next meeting, the 18th instant. Other committees were appointed, including one on permanent quarters, consisting of C. A. Brown, W. A. Stiles and W. A. Kreidler, which, considering the middle initial of each, should be an A1 committee, as it probably will.

Mr. C. H. Cone, of the Electrical Supply Company, has just returned from an immensely long business trip. Business, he says, is good everywhere, and as soon as he can get breath, he purposes another, long, strong pull. Charley had been away so long this time he was obliged to be introduced to some of his most intimate friends.

On the 2d of July the *Western Electrician* is expected to make its appearance here. Mr. W. A. Kreidler, until now the Chicago and Western correspondent of a New York paper, is the principal mover in the new journal enterprise, and has severed his connection with the New York publication with this in view.

As it never rains but it pours, a second party has been canvassing the possibilities for an electrical publication here, and seems from the number of persons interviewed and the thorough chasing up of the question to have the buzzing of the bumble bee in his bonnet badly. In several instances the gentleman has found that he was striking the "inevitable and mysterious," yet, without being able to find out the cause of this discouragement. The *Western Electrician* people had been ahead of him, and scooped the business some months ago.

Mr. Kreidler and his co-workers are jubilant over the prospects, and are thoroughly impressed with the belief that perfect success is assured for the new journal; and their friends, the electrical fraternity, will rejoice at the fulfillment of their hopes.

The Western Union office fire at Pittsburgh, corner of Fifth avenue and Wood streets on the early morning of the 10th, has thown a new element of danger from batteries. The oil covering the solutions in the cells very materially aided in the conflagration. The use of fireproof wire should prevent the recurrence of such a disaster.

Behind a telegraph switchboard even Miller, of Cincinnati, would probably be satisfied with a good quality of Undertaker's wire. Then if they will only keep clear of the electric light giants, an hundred to one the currents will not burn the insulation, or set fire to the switchboards.

CHICAGO, June 13, 1887.

OUR BOSTON LETTER.

(From a special correspondent of the ELECTRICAL REVIEW.)

The Meigs Elevated Railway Company are asking the Legislature for an amendment to their charter that the conditions imposed by the bill of 1884 are too onerous. The advantages of Capt. Meigs' system apply particularly to steam roads, and recent developments in electrical railroading have removed many of the difficulties the Meigs plan is intended to overcome. His railroad in regard to noise, dripping steam and oil is as objectionable as any elevated road. The Senate refused to suspend the rule and admit the petition.

A serious accident occurred from contact with an electric light wire on a coal shed of the Boston and Albany railroad. A boy in chasing a ball about 7 30 P.M Tuesday, June 7th, fell upon the two wires of the arc (isolated) circuit of the depot plant. The boy's body formed a shunt around a number of lamps and as the wire was poorly insulated he received a severe burning.

As steadily as if drawn by an electric motor, the West End bill has passed the House and now goes to the Senate for enactment. In the committee stages there was no opposition to the bill. Too late some of the chronic remonstrants objected, and the bill will undoubtedly become a law, although in all particulars not satisfactory. There are no guarantees that the fares shall not be more than five cents, or that the tunnels to be constructed may be used by other companies.

The New Haven Electric Light Company, after experiencing two fires in the same building with them, are now in a condition secure from damage or interruption by fire. The new station, 79 by 170 feet, is one story high, of brick, between the boiler and engine room there is also a brick partition. The steam plant includes five boilers (horizontal tubular) with Jarvis furnace, furnishing steam for ten Armington & Sims engines. Dynamos of the Thomson-Houston system are used, 14 arc and 4 incandescent. The present load is 150 incandescents and 475 arcs, of which 125 are street lights.

The Woonsocket Electric Light Company have increased their capital stock and have purchased a water power privilege and will furnish power for the electrical railroad, two miles of which are to be in operation by August 1st. They are now distributing 30 horse power by electric motors, and when the water power is in order will furnish a large amount of power by motors.

President Goodrich of the Hartford horse railroad company has been investigating the possibilities of electric propulsion for street cars. The Hartford Light and Power Company will furnish current. The tests are to be made on the main street route.

Superintendent Rich, of the Tremont Electric Light Company, has constructed a 15 pound dynamo, which gives at an armature speed of 2,000 revolutions, 45 volts, 10 amperes. The armature is 3 inches by 3 inches, the field is shunt wound. The current will be used in an electric train signaling system. The motive power is an oscillating engine, cylinder 1⅛ inches diameter 1½ inch stroke, driving the dynamo 1,400 revolutions with 45 pounds of steam. It will then ring through 40 ohms with a current of 2½ amperes. The cylinder and exposed parts are covered with nickel plated shield. A lamp at the top of dynamo is kept at a dull red; the engineer may thereby know at all times that the apparatus is in order. At 2,200 revolutions the machine lights 10 16-candle power lamps. The Tremont company are fitting Hotel Pemberton, Nantasket beach, with 200 incandescent and 20 arc lights.

The superiority of the incandescent light is never better appreciated than in hot weather. The Hollis Street Theater has been the third to introduce the Edison light from the Head Place central station. Boston is the only city in the world in which three theaters are lighted from one incandescent central station, which also distributes more power by electric motors than any two other cities in the world together.

In response to an invitation, some forty gentlemen interested in electricity met at 70 Kilby street, at 3.30 P. M., June 11th to take steps in the formation of an electric club in Boston. The electrical interests of New England were represented. Mr. A. V. Garratt called the meeting to order. The purpose of the meeting was to organize a Boston electric club, and nominations were in order for a chairman and secretary. Col. Morrison, of Baltimore, was elected chairman, and Mr. M. M. M. Slattery, of Woburn, secretary. In thanking the meeting for the honor conferred upon him, the chairman spoke of the advantages to be derived from such an organization. Mr. Garratt said the first business before the meeting would be the appointment of a committee to decide upon the organization, place of meeting, and the drafting of the constitution and by-laws, and the following gentlemen were elected: Messrs. Frank Ridlon, W. B. Hosmer, A. H. Chapman, H. H. Eustis, B. S. Flanders, R. F. Ross W. I. Barker, F. M. Gilley.

It was voted that the committee report Tuesday, June 21, that it be empowered to fill any vacancies in its body that may occur. Mr. Garratt said it was his opinion that the organization should have the following objects in view: First, to form a social club; second, to give an opportunity for persons of varying business interests to become acquainted; third, the reading of scientific and instructive papers; fouth, the opening of a club house in which strangers interested in electricity may find congenial companions. Meeting adjourned.

At a meeting of the committee immediately following Mr. Garratt was appointed secretary, and it was voted that Mr. Frank Ridlon be *ex-officio* chairman of all subcommittees. The membership committee appointed by the chair consists of Messrs. Flanders, Chapman, and Garratt; the committee on invitations, Barker, Ross, Gilley.

For the adverse report of the committee on mercantile affars Mr. Wardwell, of the House, moved to substitute a bill to amend an act to secure greater care in the transmission of telegraphic messages. Persons and corporations engaged in the telegraph business are at present liable to the amount of $100 for damages caused by their negligence or that of their servants or agents in transmitting, receiving or delivering messages. It is proposed to increase the amount in excess of which any limit of liability shall be valid by contract or regulation to $500. By a large vote placed on the calendar.

Boston, June 15, 1887.

ELECTRICAL ACCUMULATOR COMPANY'S FACTORY.

The improvements in the storage battery the past few years have placed in the hands of electricians and engineers the means of accessory supply and general distribution of electricity in a most complete form. The factories of the old world have been extended and rebuilt as the business grew, until they are not at the present conveniently adapted for economical management. In the light of past experience the electrical accumulator company have built a factory specially designed for the complete manufacture of accumulators as shown in our illustrations this week.

A siding from the railroad track runs into the yard of the factory. Pig lead is taken from the cars and melted in large iron dishes over a coke fire. The dross which forms on the surface is sold for the manufacture of litharge. The molten lead is transferred by ladles to cast iron moulds or chills, and at once the lead hardens and is removed by separating the two parts of the chill. The casting or grid is trimmed, removing all superfluous metal, including the gates. In trimming the large plates a shearing machine driven by a Reckenzaun motor on current from accumulators is used. Adjoining is the storage room, where large quantities of the lead grids of the various sizes and suitable thicknesses for positive and negative plates are kept in stock. Next is the pasting room. A plate is placed on a glass slab and a paste of red lead and sulphuric acid is applied, if a positive is to be formed. For negatives litharge is used in place of red lead. The plate is then reversed and the mixture applied to the other side, and the whole is placed in a box to dry. The apparatus for mixing the paste looks like a sausage machine and is driven by a Reckenzaun motor. The acid is brought in lead pipes from a tank 100 feet away. A narrow gauge surface track runs from one end of the factory to the other, and combined with a complete system of overhead railway transportation is quickly and easily accomplished. The drying room to which the plates are brought in boxes and kept for a day or two is kept at a definite temperature, the steam heat being regulated by the thermometer.

We next reach the forming room. On a table large sized plates are packed into the forming boxes. Lead grids are used as dummy plates in the forming boxes. The dummy plates are fitted with rubber plugs which prevent short-circuiting There are in this room eight rows of boxes, 60 in a row. Each box holds 15 A plates or 38d or 17c. Lead pipes connect with tanks one above and one below the level of the boxes, and also with the water pipes and sewer. By a lead tap at each cell the supply of acid mixture is governed. Glass tubes with rubber connection are used as syphons when the liquid is to be removed. Each may be worked independently. The large acid mixture tanks are outside of this room. They are 6 feet by 8 by 8 and all lined with lead. The upper tank 12 feet above the lower is filled from that by a steam injector, or by a lead pump recently constructed. From the upper tank the mixture is drawn for the forming boxes, pasting room and finishing room.

When soaked and dried, the plates completely formed are perforated by a machine and rubber plugs inserted. As many positive or negative plates as are to be associated in one cell, are electrically and mechanically connected by a lead strip at the top; this in the case of positives is painted red, with negatives black. To test the attachment of the active material to the grid a little delicate plate was bent by striking on the table and straightened without any change. Adjoining is a small room in which the storage cells for the factory are placed. There are four parallels of 36 A cells in series. For ordinary motor work one-half are used and the full number for lighting the 190 lamps in the factory. For experimental purposes any number of these cells are connected. Passing through the carpenter and pattern shop we reach the dynamo room. On the wall is a switchboard. With each dynamo is connected a double terminal switch by which connection is made with the batteries. An ammeter may be placed in any circuit without interrupting the current. By this and by the indications of a voltmeter the charging is under full control.

The dynamos are nine in number, three Edison, two 125 ampere, one 60 ampere capacity, and 6 Griscom 40 ampere. One of the latter was run continuously for 18 days and nights, and stopped not for any accident to the dynamo.

In the engine room are two Watts-Campbell-Corliss engines 100 horse-power, each built specially for this plant. They deliver 1 indicated horse power for less than 3 pounds per hour of wheat coal, costing $1.40 per ton. The boiler room contains three 5 feet by 16 feet 75 horse power boilers, each with 163 3½-inch tubes. The exhaust passes through a Berryman heater.

Service pumps and hose form a supply of fire apparatus in the use of which the hands are drilled. Only one of the engines is at present connected, the other being held in reserve. About 85 horse power is used. The fly-wheel is in 8 sections, 16 feet diameter, 40 in fact; it is run at high speed, and each section is balanced within 4 pounds. On the other side of the passage-way is the store room under the charge of a clerk. Near by is the wareroom filled with glass boxes, jars, wooden boxes for shipping; the surface track runs from this room into the yard to the railroad track.

In a little room separated by brick partition, and lined with tin and iron, is a battery for the use of the laboratory and testing room, where may be seen in progress experimental work. Every convenience in the line of switches and instruments is provided, and adjoining is the galvanometer room, the window of which can be completely darkened. The instruments rest on brick foundations.

Adjoining is the office, and above is a handsome and convenient suite of rooms, where the officers of the company can remain over night.

From the cars loaded with pig lead to the shipping of the finished cells in every case all loads are carried by the surface or overhead railways. The convenient arrangement for distributing the acid enables the output to be large.

Telephonic News

Sometimes, upon the busy wires,
The gentle winds breathe sweet and low,
As if they found them tuneful lyres,
On which to whisper as they go.
When wintry winds go roaring by,
They stir to louder, wilder tones,
Or, sinking to a murmuring sigh,
Breathe out a message full of moans.
The tones seem full of joy or woe,
Or bring to pain a sweet release.
I listen, as the wild winds blow,
In hopes my heart may find some peace.
I, listening, wait if I may hear,
In all their tones, one word more clear—
One message meant alone for me:
"I come, dear heart, I come to thee."

***At the general assembly of the Tramways Company, of Berlin, the director of the society announced that the committee of administration had the project in view of substituting electricity for horses.

***On the 15th of April last experiments were made of electrical traction at Cologne, with accumulators placed under the seats of the carriage. Very satisfactory experiments were made of the line of tramways from Cologne to Ehrenfeld.

*** The Jablochkoff Electric Company—the title of this corporation—which was one of the earliest formed for the purposes of electric lighting—will be in future the United Electrical Engineering Company, Limited, of 36 Albert Embankment, Lambeth, S. E., London.

*** The telephonic line between Paris and Havre was inaugurated Saturday, May 7th, and was opened to the public the day after. The tariff is fixed at one franc for five minutes' talk. Until further orders, communications can be had only between the Bourse or Stock Exchange of Paris and the central office at Havre.

*** The ELECTRICAL REVIEW received a telegram last week from a friend riding on the Lehigh Valley Railroad. The train was speeding along at the rate of fifty miles an hour, yet the message was sent out by means of the new induction system now working on that road as easily and perfectly as though the operator had been in the station.

*** The River Plate Union Telephone Company, of Buenos Ayres, united lately with the Gower-Bell Company, which gave the new company a subscription of 3,800 subscribers. Immediately after the uniting of the two companies, rates of rental of instruments were raised from 37 to 60 francs per month, without heeding the protests of the public. The result was that the new company lost 2,000 subscribers in fifteen days, and a new co-operative company has been formed, with a capital of one million francs, which commenced immediately the construction of new lines and plants.

*** "But few people know how much hypocrisy there is in the world," said a young lady employed in a telephone exchange recently, "and of that few the persons who have the opportunity to hear all the telephone talk of a city the size of Indianapolis may be numbered. There are not many men in business in Indianapolis that I do not know like a book. I am not personally acquainted with a half dozen of them, perhaps, but I know just what kind of men they are from hearing them talk over the telephone. I sometimes am horror-stricken at the language used by men who in society and among their friends are regarded as nice fellows. I have in mind many prominent church members who sometimes make the exchange girls who happen to be listening blush with their talk over the wire. If there is anything bad in a man the telephone seems to bring it out, and a great deal is brought out of many who profess to be wholly good."

Foreign Statistics of Telegraph Lines.

The last edition of the *Telegraphic Annual*, published in London, gives the following statistics of the telegraphic lines of the different nations:

States.	Eng. Miles.
Belgium	5,711
France	61,286
Switzerland	4,349
England and Ireland	30 276
Germany	51,869
Netherlands	2,938
Turkey (Europe)	14,618
Denmark	2,447
Greece	4,054
Italy	18,359
Austria-Hungary	35.086
Servia	1,736
Portugal	3,111
Roumania	3,199
Bulgaria	1,521
Spain	11,158
Norway	4,591
Russia and Finland	68,611
Sweden	5,361
Total for Europe	328,281
Cochin China	1,444
Ceylon	1,158
Dutch Indies	3,492
Persia	3,209
Japan	5,583
English Indies	25,380
Philippian Islands	718
Tonquin	159
English Colonies of the Strait of Sonde	121
China	944
Total for said countries	42,308
St. Salvador	1,260
Cuba	2,811
Guatemala	1,816
Honduras	1,349
Nicaragua	1.416
Mexico	19,489
Chili	7,625
Argentine Republic	12,479
Costa Rica	450
Uruguay	1,032
Canada	20,466
Columbia	2,857
Peru	1,382
Venezuela	1,145
Guiana	264
Brazil	6,432
Ecuador	400
Paraguay	45
Bolivia	180
Total,	82,348
Tunis	1,874
Algeria	3,661
Cape Colony	4,244
Senegambia	1,585
Egypt	5,858
Orange, Free State	560
Transvaal	120
Mozambique	53
Angola	219
Total	18,220
Tasmania	1,635
New Zealand	4,463
Australia	30,000
Total for Australia	36,098

Deaths Produced by Electricity.

M. A. d'Arsonval, in a note presented to the Academy in April, discussed the matter of deaths produced by electricity in the several forms of static, battery and machine currents, both continuous and alternate, of extra currents and induction, with and without condensers.

His conclusions are that death from electricity may occur in one of two methods:

"1. By direct, or disruptive action, when the tissues of the body are mechanically destroyed, and

"2d. By reflex or indirect action upon the nerve centers, producing a variety of physical derangements which eventuate in death.

"In the first case the result is definite and incontrovertible; but in the second experiments with animals have demonstrated that for the most part such individuals may be restored to life by artificial respiration if this remedy is applied at once and adhered to.

"A static discharge is not necessarily mortal save where this, when concentrated upon some sensitive part, exerted a striking force equivalent to about 3 kilogrammeters.

"With a battery of 420 volts, death could only be produced by frequent interruptions of the current and prolonging the applications. Death in this case is rather due to tetanus than to the direct action of the current.

General Stager and His Ways.

Prof. Barrett, superintendent of the Fire Alarm Telegraph, was a warm friend and admirer of Gen. Anson Stager during that eminent telegrapher's lifetime. Barrett began life as a sailor, but got his leg broke, and was forced to seek some other business where a lame leg would be less inconvenient. So he learned telegraphy. He had almost no education, but he saw it was not too late to acquire one. So he set himself to study up, and read everything about electricity and telegraphy he could buy or borrow. He also began experimenting on his own account, and when not at work was always studying. In time he had not only become a competent operator, but an expert electrician, and Gen. Stager found him a very valuable man and intelligent adviser. One day when he happened to be in the general's office the latter asked him if he had any money. Barrett promptly told him that he had been at work, at one job or another, but always on salary, for nineteen years, and all he had saved was invested in a little home on the north side, worth perhaps $3,000. The general then suggested that he try to raise $10,000 among his friends if he could, and bring it to him for investment. Barrett went out and took to "hustling," and in the course of a few days called again with $6,500, all he had been able to beg or borrow. The general added the lacking $3,500 and invested it in telephone stock, sending him the certificates. In about six months the dividends had paid up what he owed and left him his stock clear. Before the end of the year the general advised him to sell part of his holding, which he did for $150, and to his surprise the stock immediately began to go down, and in a short time he was able to buy it back again, on the general's advice, at a figure away below par. He then left his stock in the general's hands to do with it as he liked, and heard no more about it until after the general's death. He did not know what had become of it until somewhat later, when he received a note from the general's daughter, saying a package had been found for him among her father's papers, which he would please call and get. He called as requested, and was given a sealed envelope containing securities worth $18,000

Three Squibs With a Slight Electrical Tendency.

AN UNTENABLE DEFENSE.

Police Judge (severely)—Prisoner at the bar, you are charged with wanton and unprovoked assault on this district messenger boy, who appears here as complaining witness. What have you to say in your own behalf?

Prisoner (volubly)—You see, your Honor, I was coming down the street when this boy dashed out of the bank and dashed against me——

Judge (doubtfully)—You say he ran out of the bank?

Prisoner (confidently)—Yes, your Honor. He ran out, as I said, and——

Judge (contemptuously)—You dare to come here and tell this court that a messenger boy ran! I'll have you to understand, sir, that this court cannot be trifled with. Fifty dollars or fifty days in jail—*San Francisco Post.*

HE WAS A CLOTHES LINEMAN.

Tramp—I'm a lineman by trade, mum, and out of work. Could you——

Housewife—What is a lineman?

Tramp—A lineman, mum, is one as inspects lines.

Housewife—What kind of lines?

Tramp—Telegraph lines, mum, and telephone lines, and——

Housewife—Clothes lines. I know you, Scamper.—*Omaha Hera'd.*

TWO BIG BLOWS.

A Dakotan and a Texan who met in Chicago were disputing about the greatness of their respective districts, and among other things traded marvelous stories about the wind in each locality.

"How fast does a Texas norther blow?" asked the Dakotan at last.

"How fast? Well, the only thing that will measue it is lightning. When a Texas norther is coming they telegraph ahead, so that people can get underground, but when it gets under good headway it will just about run a neck and neck race with the telegram. How fast's a Dakota blizzard?"

"Oh, you can't measure a blizzard. There's nothing like it. I've seen a blizzard skin a telegraph message right off the wires and carry it on ahead. I never saw but one the speed of which could be measured. There seemed to be something the matter with that one. It went rather slow, only about 1,000,000 miles a second, and we couldn't tell what was the matter with it until it went by, when we found it was dragging one of those infernal Texas northers along behind."—*Chicago Tribune.*

Electric Pot Boiling.

The *Centrablatt Elektrotechnik* announces that the Edison German Society has constructed an electric kettle, in which the source of heat is constituted by a bobbin of resistance, placed in a recipient, furnished exteriorly by a circular protuberance in the form of a cushion, with a hole in the middle, and on which the kettle rests.

With this apparatus a liter of water can be made to boil in fifteen minutes with a current which comes to one cent, by tariff of the Municipal Society of Electricity, of Berlin, and which would cost still less if one had and manipulated his own installation.

The electric boiler is made of copper, of an elegant form, and reposes on a plate of polished wood.

—— The *London Electrician* says that Dr. Aron, of Berlin, some time ago devised an ampere meter, based upon the principle adopted by Profs. Ayrton and Perry in their original watt meter, in which the retardation of a clock pendulum indicated the expenditure of power. In Dr. Aron's instrument for measuring current (or volts) the bulb of the pendulum is replaced by a permanent magnet, and below this is placed a coil traversed by the main current. The pendulum is therefore subject to acceleration when the current passes. By comparing the time of this clock with standard time, and multiplying by a constant, the amperes or volts are integrated. The instrument has the obvious defect of depending upon the constancy of a permanent magnet, and when that magnet, as in the present case, swings to and fro in a variable field, it seems doubtful whether the calibration will long hold good. However, Dr. Aron, without altering this feature, has recently effected certain improvements in the construction, which are thus described in *Industries:* "There are two pendulums, one with a magnet, the other with a common bulb. Each actuates its own escapement, and by a train of planet wheels the differential motion is registered on a dial similar to that of a speed counter or gas meter. Dr. Aron has also added a magnetic catch, which arrests both pendulums when no current is flowing, and releases them when one-tenth of an ampere or more is passing. By this addition the interval for rewinding the clock has been increased to about four weeks for average work."

If we are to believe an Austrian paper says *La Lumiere Electrique*, the first lightning rod was not constructed by Franklin, but by a monk of Seuftenberg, in Bohemia, named Prohop Diwisch, who installed an apparatus the 15th of June, 1754, in the garden of the curate of Prenditz (Moravia).

The apparatus was composed of a pole surmounted by an iron rod supporting twelve curved up branches, and terminating in as many metallic boxes filled with iron ore and, closed by a boxwood cover, traversed by 27 sharp iron points, which plunged at their base in the ore. All the system was united to the earth by a large chain.

The enemies of Diwisch, jealous of his success at the court of Vienna, excited the peasants of his locality against him, and under the pretext that his lightning rod was the cause of the great drought, they made him take down the lightning rod which he had utilized for six years.

What is most curious is the form of this first lightning rod, which was of multiple points like the one which M. Melseu afterwards invented.

OUR KANSAS CITY LETTER.

From a Special Correspondent of the ELECTRICAL REVIEW.

The agitation for underground wires has taken a new turn. The opposition of the electric companies in the city caused the Council to drop the matter, and now local capitalists have taken it up and are about to undertake it as a means of profitable investment. Messrs. J. Foster Rhodes, H. P. Churchill, and L. R. Moore had an ordinance introduced into the Council last week, asking permission to build electrical conduits in any or all of the streets in Kansas City. Section first of the proposed ordinance grants them the permission, while the second section provides that the conduits shall be built parallel with the curb lines of the street, and at such distances from the curbstone as shall not interfere with water, gas or sewer pipes. The company agrees to furnish free of charge space for fire and police alarm and telegraph wires belonging to the city. Mr. H. P. Churchill states that the company proposes to build these conduits wherever in Kansas City they shall be needed or desired. The object is to do away entirely with the system of poles and overhead wires. The Dorsett underground system now in operation in New York, Chicago and Detroit will be used. If permission is granted work will begin on the conduits at once. The ordinance is now in the hands of the committee on public improvements and the city engineer.

Mr. D. H. Dorsett, the proprietor of the system, is in the city, conferring with the gentlemen connected with this enterprise. In conversation with your correspondent he said, "The conduit system is becoming recognized in all the principal cities as the safest and most economical plan of caring for electric wires. In the spring of 1884 the City Council of Chicago granted a franchise for a conduit company. In the following fall I contracted with the company to put in a comprehensive and inclusive system of conduits. A comprehensive system means that the space required for the next twenty years is comprehended, while inclusive means that it is suitable for both low and high tension currents. The former is required by the telephone companies and the latter by the electric light and telegraph companies. Two years later I was granted the contract for an underground system in New York. I now have finished forty-eight miles of conduit in New York city proper and five miles in Brooklyn. I have also placed conduits in St. Paul, Minneapolis, Milwaukee, Detroit and other large cities. My system does away with the interference of induction and the other troublesome qualities of electricity."

The Fifth street electric line is now in operation, and is running four and five cars regularly. A speed of eight miles an hour is maintained for the entire length of the road, and on trial bursts of speed attained a rate of sixteen miles an hour, with a heavily loaded car. The cars run forward and backward with equal ease, and the speed is accelerated or decreased as gradually as may be desired. The new machinery of the company gives the utmost satisfaction. The question of a franchise for the operation of the line has not seemed to bother the company any. The condition of affairs is about as follows: Over a year ago the Council granted a franchise to what was known as the Fifth Street Railway Company for a railway on Fifth street. Tracks were built for a horse car line, but operations never began. Afterward the Electric Railway Company leased the tracks, rights and privileges of the Fifth Street Railway Company. A short time ago the Council repealed the franchise of the latter company. Whether this has any effect on the electric road is not determined, but the prominent attorneys, including the City Counselor himself, give it as their opinion that the Council had no right or power to repeal the franchise after the tracks had been built, and had been virtually in operation through the lease of the electric road.

The Stockton Electric Light and Power Company, of Stockton, Kas., has been incorporated, with a capital of $10 000 and the following directors: J. M. Wells, D. E. Miller, Charles C. Woods, O. A. Higgins and H. C. Reimes. The plant will cost $10,000, and be completed by January 1, 1888.

The City Council is called upon to pass large appropriations, every month, for the payment of the companies furnishing the city with light. Many complaints have been handed in to the members of the Council for the past year of dead lights, and the Council finally resolved that it would not pay for lights that were really not lights, and instructed the police to carefully watch the lights and every time a light was not burning. The first month's report was a surprise, over 300 lights being reported as not in operation during the month. The accounts of the lighting companies were reduced accordingly, and this has had a very salutary effect, as will be seen by the report of the police for May, which was of 123 dead lights—59 gas, 51 electric and 13 gasoline.

An ordinance for the franchise for the Edison Electric Light Works has been introduced in the Council and referred to the committee on public improvements.

An electric light company is being organized in Liberty, Mo.

The Union Pacific Railroad is talking of adopting an electric headlight. The engine is a late invention. The generator is fastened to the footboard of the engine and operated by the drive wheels.

An electric light plant is being placed in position on the grounds of the exposition, and work on the buildings will proceed during the night as well as day.

The Atchison, Topeka and Santa Fe Railroad has a number of its Kansas City suburban trains equipped with the Stocker Electric Signal and Motor.

"There is something in the wind," said an eastern traveling man to your correspondent in the lobby of the St. James Hotel, the other day. "If Ed. Stokes, of New York, didn't pass through Kansas City this morning, his *alter ego* did. I had a talk with one of the telegraph officials who accompanied him, and, although he denied that the gentleman, whom I am willing to swear was Stokes, bore that name, he let enough hints fall to give me a pretty good idea of what was going on. From the vague and evasive replies he made to my questions I learned that they were *en route* to Denver, with a view to consummating, perhaps, the largest telegraph deal of the year not excluding the alleged transfer of the B. & O. telegraph system to Gould. It is nothing less than the stretching of wires from Kansas City to Denver, thence to Los Angeles, thence to San Francisco. From that point the wires will go to Victoria, where connection will be made with the prospective Pacific cable, in which Bennett, Mackay and Stokes will have an interest. You can take my word for it that it means business and that Kansas City will be the greatest relay station in the country before the end of the decade."

Recent advices from Mexico give account of a telephone war in the city of Mexico. There is an extensive system there owned by a Boston company and managed by M. L. Guirard, a native of the States but a naturalized Mexican. Subscribers were notified lately that on account of the depreciation in silver the rates would be increased from $5.25 a month to $6 25. Considerable dissatisfaction was expressed. A number of the business firms have ordered their instruments removed, and steps are being taken to organize a new company. G. M.

KANSAS CITY, MO., June 10, 1887.

FIG. 2.—VIEW OF THE ELECTRICAL ACCUMULATOR COMPANY'S FOUNDRY WHERE LEAD GRIDS ARE MOULDED.

Experiments With Static Electricity.

According to the London *Electrician*, the following interesting experiments were described by Mr. Boys at a recent meeting of the Physical Society:

"If sealing wax or any similar sticky substance be melted in a cup and put upon the conductor of an electrical machine, as in one of the old-fashioned experiments, it will begin to throw out threads in an extraordinary way; the fibers are large when the resinous matter is very hot, and each fiber shoots out as a cylinder with remarkable speed then breaks into beads. These minute beads can be made to patter against a drum head, and make a noise upon it like falling rain. The cup containing the melted wax should be inclined from the operator, and from the electrical machine before the latter is worked, or both will be covered with the most invisible sticky web imaginable. A cup of burnt India rubber being so treated sends out almost invisible filaments. Canada balsam is the perfection of a material for producing sticky threads. When a candle is held near a cup throwing out such electrical filaments, they shoot into the flame and sometimes cover the candle; sometimes they will stop as they approach the flame, then turn back and go into the cup from which they started, in consequence of discharging their electricity into the flame. In a few minutes, miles of these sticky threads can be made, and, as they break into beads, the method affords a ready means of powdering such of these substances as are not easily pulverized in any ordinary way."

New Central Electric Light Station for Vienna.

Some time ago our Vienna correspondent sent us a list of the central stations which are projected for Vienna, and amongst these was one proposed by Herr Fischer. We now learn from the same source that a few days ago the Municipal Council had this project under consideration, and formulated the conditions under which the supply of electricity must be undertaken. As these conditions will, no doubt, form a precedent for similar undertakings, and may thus be of interest to English electricians and contractors, we give herewith a condensed abstract. 1. The contractor is obliged to supply electricity to any householder along the street where his cables are placed. In neighboring streets he will be obliged to supply electricity if the demand equals or exceeds five 16 candle power lamps per meter, run from the nearest distributing box. The supply will be compulsory between the hours of 4 P. M. and 1 A. M., for any number of lamps, however small; but for customers requiring not less than 250 lamps, the supply will be compulsory for eighteen hours out of the twenty-four. The supply to the municipality is also compulsory for the same length of time, if their requirements in any place exceed fifty lamps. 2. The service wires from the distributing boxes to the customers' terminals are to be supplied by the contractor. The internal wiring of the houses is to be supplied at the expense of the customer, but at prices which will be subject to revision by the municipality. 3. If the consumer's installation is fitted up by a third party, the contractor has the right to refuse a supply, unless he has tested it to his own satisfaction. For this test he is allowed to make a charge according to the size of the installation, on the basis of 50 kr. per glow lamp and 5 fl. per arc lamp. 4. The meters must be of a type approved of by the municipality or Government, and the cost of any test as to the accuracy is to be borne by the contractor. The charge for meters is fixed as follows:

Each 10 light (16 candle power) meter, 15 fl. per annum.
Each 25 light (16 candle power) meter, 20 fl. per annum.
Each 50 light (16 candle power) meter, 30 fl. per annum.
Each 100 light (16 candle power) meter, 40 fl. per annum.

5. The customer has to pay 50 kr. per month for every glow lamp installed, and in addition 4 kr. per lamp hour for the current required per 16 candle lamp. The latter figure will be reduced to 3 kr. as soon as the total number of lamps fixed has reached half the capacity of the central station, provided the average time of lighting exceeds 2½ hours per day. The prices of other lamps are based upon that of the 16 candle lamp as unit. Thus, the following are the figures to be paid per lamp hour:

10 candle lamp hour, 2.5 kr. maximum, and 1.75 kr. minimum.
16 candle lamp hour, 4 kr. maximum, and 3 kr. minimum.
32 candle lamp hour, 8 kr. maximum, and 6 kr. minimum.
50 candle lamp hour, 12.5 kr. maximum, and 8.75 kr. minimum.
100 candle lamp hour, 25 kr. maximum, and 17.5 kr. minimum.

6. The candle power is to be measured by means of Hefner von Alteneck's amylacetate lamp. 7. The customer may employ any kind of glow lamps. If he obtains them from the contractor, he has to pay for each lamp 75 kr. per quarter, to cover renewals and fair wear. 8. Current for arc lamps, motors and other purposes will be supplied according to private arrangements between contractor and customer. 9. The supply of current is only compulsory if the customer agrees to take it for a period of at least one year. Three months' notice of discontinuance of the supply must be given after the first year. 10. The municipality pay at the above rates, with a discount of 25 per cent. 11. The meters and conductors are, from time to time, to be tested. 12. If the customer does not pay, or otherwise violates his contract, the contractor has the right to discontinue the supply.

It will be seen from the foregoing that the conditions imposed upon the electric light contractor are rather severe, and in some cases too loose; as, for instance, with respect to arc lamps and motors. On the other hand, the price which the contractor is authorized to charge for the current is a fair one, and corresponds to about 10d. per Board of Trade unit. This ought, with good management, to leave an ample margin for profit.—*Industries.*

Zircons for Electric Light.

EXPERIMENTS TOWARDS IMPROVING THE CARBONS NOW IN USE.

Our contemporary, the N. Y. *Evening Post*, publishes the following:

"A serious item in the expense of electric lighting by the arc system is the cost of the carbons used and the cost of replacing them daily. The ordinary carbons, such as are used in our city lamps, cost about $25 a thousand, and the business of manufacturing them is a separate one, of which two or three firms have a virtual monopoly. With the exception of the Brush Company, none of the electric light companies makes its own carbons At first the material used was gas retort coke finely pulverized, moulded, baked and coated with copper. For several years past what is known as petroleum coke, another refuse of petroleum refining, has been almost exclusively used, and still more recently the carbons obtained from the smoke of the natural gas at Pittsburgh has been found to be excellent. When coke has to be ground up there is always a possibility that minute particles from the pulverizing rollers will get into the carbon and make the light flicker; this trouble led to the use of an air blast, which now grinds the coke to powder as quickly as rollers, and without adding any injurious substance. The light in the arc lamp is caused partly by the electric spark passing between the points of the two carbons, and partly by the high incandescence of particles of carbon which fly from one pole or carbon to the other. The perfect carbon would be one which used only enough of its particles to give this brilliant light and no more. Numberless attempts have been made to find a substance better fitted than carbon for this purpose. Gen. Thomas L Clingman, of North Carolina, is at present in New York, with the intention of showing electricians and capitalists a substitute for carbon which he offers—zirconia.

Gen. Clingman's attention was directed to zirconia, the oxide of zirconium, which he uses for electric light carbons, more than thirty years ago, when zircons, as the natural crystals of zirconia and silica are called, were almost unknown, by the visit of a famous Philadelphia geologist who had traveled all the way down to Henderson County, N. C., to see the place where these zircons were found by the bushel. Only a few places in Europe were then known to furnish them. Since then they have been found in several places in the United States, and, if required in large quantities, they can be furnished for a few cents a pound. For miles in Henderson County they may be found on the surface, and the gatherer has only to scoop up a shovelful of earth in order to pick out a handful. Zirconia, the fine white powder which is obtained after eliminating the silica, can be moulded into any shape. Gen. Clingman proposes to use it in various ways One way is to make a pencil of it which can be heated to incandescence by electricity; it is already used to obtain light by being subjected to the heat of an oxy-hydrogen flame, and proves to be of remarkable durability, far beyond that of platinum. lime, magnesia, etc. A thin edge of oxide zirconia remained for two months unchanged under the constant flame of a compound blow-pipe. Gen. Clingman has obtained a patent for the use of zirconia for such a purpose, and believes that under a powerful electric current such a pencil as he describes, made of carbon and zirconia, would last for months.

"A second use to which General Clingman proposes to put zircons is to grind them up with the carbon used in making carbons for arc light, using zircons, to perhaps 10 per cent. of the weight of the carbon. According to his theory the superior endurance of the zirconia will retard the disintegration of the carbons and make the light more brilliant. As yet he has not succeeded in getting such carbons made exactly in accordance with his wishes, but the tests made are satisfactory. Mr. Lynch, the electrician of the United States Illuminating Company of this city, made some trials with these zirconia carbons, and reported that the results were sufficiently good to warrant further experiments. Upon the other hand, officers of the Brush Company say that their trials resulted uniformly in failure Gen. Clingman is now expecting every day to receive carbons made exactly according to his directions, both made entirely or chiefly of zirconia for a permanent incandescent pencil and of carbon mixed with zircons for use in ordinary arc lights."

FIG. 3.—PASTING ROOM, SHOWING MIXING OF PASTE AND PASTING OF PLATES IN FACTORY OF THE ELECTRICAL ACCUMULATOR COMPANY AT NEWARK, N. J.

Stability of Patents in the United States.

Although the patent system of the United States involves a search on the part of the Government as to the novelty of the invention, yet it has been a frequent remark on the part of the general public that few patents can stand the test of the courts; this ratio is sometimes stated to be as high as nine out of ten, or some equally conventional fraction. A member of the bar has recently tabulated the adjudication of patents by the United States courts, as recorded in Meyer's Federal Decisions from 1776 to 1835, and finds that 73 per cent. of the patents upon which suit was brought were sustained. The total number of patents brought to an issue was 983, and of these 269 were annulled, and of the remaining 714 which were held valid, 480 were sustained in full, and 234 were held to be valid in part. When it is considered that the United States patent law requires that protection can be accorded only to the original inventor who has added to the state of the art, and to that portion of his invention which does not include any portion of public knowledge, or the work of other inventors, whether patented or not in any country, and that the time covered by this investigation covers the early period of their history before the system was thoroughly formulated and crystallized by legal decisions, this is a remarkable showing, testifying to the skill of the patent solicitors and also the examiners in their patent department. It is difficult to estimate the value of the patents still in force; although such estimates have been made, they are necessarily vague and void of the precision essential to accurate statistics; yet the amount of capital invested in faith upon the validity of patent protection is very large and generally remunerative to a satisfactory degree.—*Engineering.*

—— The Hitchcock Carriage Company, at Cortlandt, N. Y., have adopted independent power for their new factory. No overhead shafting is used, but the main line shaft runs underneath the floor. A 100 horse power Westinghouse engine is set in a pit so located that the engine couples direct to the shaft at about its center. Main belts and pulleys are dispensed with and the countershafts and belts are underneath the main floor, leaving the head room entirely free.

—— The Taylor Manufacturing Company, of Chambersburg, Pa., is meeting with fine success in presenting the "Beck Automatic" engine to the electric light fraternity. All work turned out by this well-known company can be relied upon. From the rapidly-developing field of electric lighting a satisfactory increase in their engine trade may be expected, as the excellent features of the "Beck" become more widely known.

—— The German Edison Company is selling an electric water heater for heating shaving water, boiling an egg, or making coffee, etc., etc. It consists simply of a metallic vessel containing an inner casing within which is placed a coil of German silver. A liter of water can be made to boil in twelve minutes with a current of four amperes and 100 volts, and at a cost of about 2d., according to the tariff at present in force at Berlin. The convenience of such an apparatus is so great that its introduction in all cases of central station lighting is probably a mere question of time.

—— The Pittsfield Electric Illuminating Company, of Pittsfield, Mass., are changing their plant from the old direct current system to the Westinghouse alternating system. Their first installment is for 1,300 lights, and they have received the contract for the city lighting for the ensuing year. Twenty-five candle power lamps will be used. They are also preparing to run a line to Lennox, Mass., a distance of six miles, for the purpose of lighting the summer residences in that town.

—— The Legal Bureau of the National Electric Light Association, of which Mr. Arthur Steuart, of Baltimore, is general counsel, has offices for the convenience of members at No. 605 Seventh street, Washington; No. 213 East German street, Baltimore; and in Temple Court, New York city. All mail communications should be addressed to the Baltimore office, but appointments can be made with Mr. Steuart at any of the above offices.

—— Mr. Geo. P. Rust, Secretary and General Manager of the Passaic (N. J.) Electric Light Company, has been elected city attorney of that city. Mr. Rust is a young lawyer of ability, and takes quite an interest in electric lighting matters.

—— The Aldermen of New York last Thursday granted a franchise to the Mutual Electric Illuminating Company, of Brooklyn, operating the Knowles system, which possesses several excellent features. The company agrees to give the city 20 per cent. of its gross receipts, which at 50 cents a lamp per night would make the price net to the company, 40 cents a lamp. The Mutual Electric Manufacturing Company is meeting with much success in introducing its new ammeters and volt-meters, and particularly the time cut out for storage batteries. A great many inquiries are received concerning the cut-out, and orders have been booked for quite a number of them. The company has just issued a new catalogue and price list which can be had on request being sent to the company at 292-296 Graham street, Brooklyn.

—— The announcement is made of the wedding reception of that well-known and popular gentleman, Col. Gardiner Sims, of Providence, and Miss Laura Brayton, of that city, which occurs at the residence of Mr. Herbert N. Fenner, in Providence, June 23. Col. Sims will receive the unanimous congratulations of his electrical friends, in which the REVIEW most heartily joins.

—— The Brush Electric Light and Power Company is now adding a $20,000 new plant in Galveston, Texas.

——"Twist, twist, twist," was the refrain of a student in electricity at a noted university; "binding screws of all kinds are scarce in this laboratory. They have a few on the apparatus in the glass cases. In some experiments I have made over two dozen contacts by twisting the wires. To make the readings, I had to change from one instrument to another, and the ends of the wires became hardened by repeated bending, and broke." It is true that in the convenience of switches, circuits, cut-outs, the laboratories of the theoretical schools are far behind the testing room of novices in experimental electricity. This should not be. Students can ill afford to waste their time on clumsy, poorly adapted apparatus. The necessities of commercial success in electricity have made great improvements in the materials and apparatus for practical investigation. To fail to make use of these is to employ means years behind the times.

ELECTRIC LIGHT NEWS

—— The Millbury (Mass.) Electric Company, Millbury, Mass., has been incorporated. Capital stock, $10,000. C. D. Morse and others incorporators.

—— The United Electric Light Company, Springfield, Mass., has been incorporated. Capital stock, $100,000. Gideon Wells and others are the incorporators.

—— The Mather Electric Company, North Manchester, Conn., will erect a 48x24 feet addition to its works, and on the 1st of July will move from Hartford to North Manchester.

—— The town of Bellevue, Penn., is introducing an electric railway operated from 100 horse power engine, the contract for which has been awarded to the Westinghouse Machine Company.

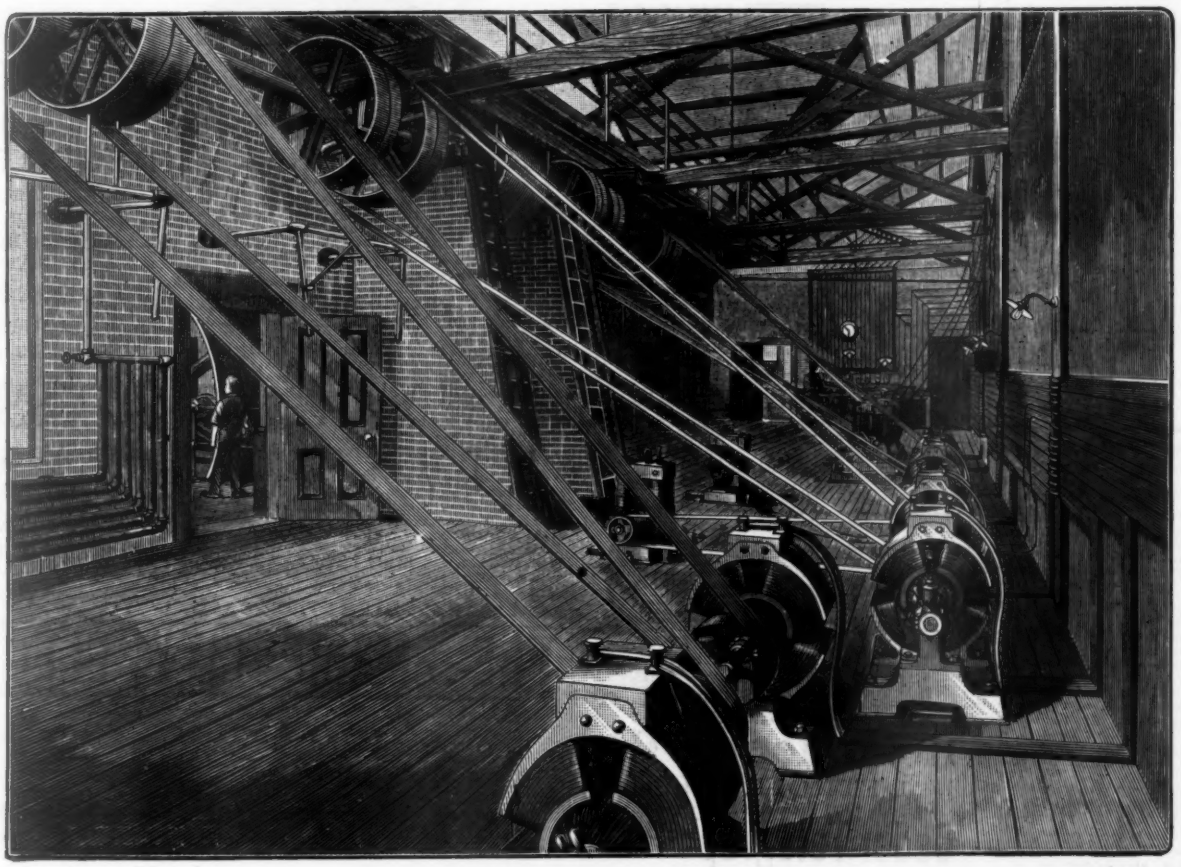

FIG. 4.—FACTORY OF THE ELECTRICAL ACCUMULATOR COMPANY. DYNAMO ROOM, SHOWING TEN DYNAMOS.

—— The report of the Board of Directors of the German Edison Company contains an announcement of some interest. Reference is first made to the development of the company's business, and attention is called to the great difficulties against which it has had to contend, especially those created by the unjustifiable imitations of the incandescent lamp patent. Although five judgments have been delivered in favor of the Edison Company, a definite decision has not yet been arrived at. It is complained that in the meantime a patent has run more than half its time, and the competition, against which thoroughly energetic steps cannot be taken, is continually increasing. The Edison Company has for years been carrying on fruitless negotiations with a view to liberating itself from the crippling influence of the French Compagnie Continentale. This state of affairs drew the Edison Company towards the firm of Siemens and Halske, and has led to an extension of the contract already existing with that firm. The title of the Edison Company will now be changed to the "Allgemeine Elektricitats Gesellschaft" (Universal Electric Company). It may, therefore, we assume, be understood that the interests of the Berlin Edison Company will henceforth be closely identified with those of the eminent firm above mentioned. The directors recommend the payment of a 4 per cent. dividend, and propose to increase their capital from £250,000 to £600,000.

ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING JUNE 7, 1887.

364,204 Railway signal; James H. Armstrong, Houston, Tex.

364,235 Electric gas lighting apparatus; Israel Fisher, Medford, Mass.

364,271 Telegraphy; Louis Maiche, Paris, France.

364,343 Type-writing machine; George W. Hale, Washington, D. C.

364,344 Galvanic battery cell; J. Randolph Haid, New York, N. Y.

364,356 Telegraphic alphabet; William A. Leggo, Montreal, Quebec, Canada, assignor to Jackson Rae and James Cradoch Simpson, both of same place.

364,429 Electric clock; Gustaf E. Mejer, Providence, R. I.

364,444 Annunciator system; Paul Seiler, San Francisco, Cal.

364,471 Telegraphy; Leo Boch, jr., New York, N. Y.

364,472 Recording and reproducing sound waves; Leo Boch, jr., New York.

364,475 Telephone transmitter; James W. Bonta, Philadelphia, Pa., assignor to the American National Telephone Company, of New York.

364,518 Thermostatic circuit closer; Warren S. Johnson, Milwaukee, Wis.

364,525 Type-forming and composing machine; Tolbert Lanston, Washington, D. C., assignor, by direct and mesne assignments, to the Lanston Type Machine Company, same place.

364,558 Electrical contact device for hose couplers; William F. Wamsley and Thomas McIntosh Walla Walla, Washington.

364,559 Electrical contact device for hose couplers; William F. Wamsley, Walla Walla, Washington.

364,619 Relay instrument, Granville; T. Woods, Cincinnati, Ohio.

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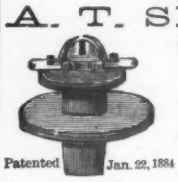

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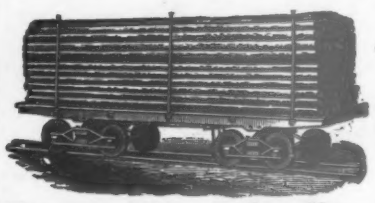

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